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Draft Methodology for a Comparative Analysis of ANSI/ASHRAE/ IESNA Standard 90.1–2007 and Standard 90.1–2004

Prepared for
United States Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Program

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TABLE OF CONTENTS

LIST OF ACRONYMS

AEO	Annual Energy Outlook
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
CBECS	Commercial Building Energy Consumption Survey
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
ECPA	Energy Conservation and Production Act
EIA	Energy Information Administration
EPCA	Energy Policy and Conservation Act
EUI	energy use intensity
FR	Federal Register
IESNA	Illuminating Engineering Society of North America
NEMS	National Energy Modeling System
PNNL	Pacific Northwest National Laboratory
RECS	Residential Energy Consumption Survey
SSPC	Standing Standard Project Committee
U.S.C.	United States Code

1. INTRODUCTION

1.1 Statutory Requirements

Title III of the Energy Conservation and Production Act, as amended (ECPA), establishes requirements for the U.S. Department of Energy (DOE, Department) with regards to building efficiency standards. (42 U.S.C. 6831-6837et seq.) ECPA provides that whenever the ANSI/ASHRAE/IESNA Standard 90.1-1989 (ASHRAE 1989) (Standard 90.1-1989 or 1989 edition), or any successor to that code, is revised, the Secretary of DOE must make a determination, not later than 12 months after such revision, whether the revised code would improve energy efficiency in commercial buildings and must publish notice of such determination in the Federal Register. (42 U.S.C. 6833 (b)(2)(A)). If an affirmative determination is made, then not later than 2 years after the date of the publication of such affirmative determination, each State is required to certify to the Secretary that it has reviewed and updated the provisions of its commercial building code regarding energy efficiency with respect to the revised or successor code. (42 U.S.C. 6833(b)(2)(B)(i)). The State must include in its certification a demonstration that the provisions of its commercial building code regarding energy efficiency meet or exceed the revised standard (in the case of the latest published determination, Standard 90.1-2004). (42 U.S.C. 6833(b)(2)(B)(i).))

If the Secretary makes a determination that the revised standard will not improve energy efficiency in commercial buildings, State commercial codes shall meet or exceed the last revised standard for which the Secretary made a positive determination. (42 U.S.C. 6833(b)(2)(B)(ii))

1.2 Background

1.2.1 Previous Determinations Regarding Standard 90.1 {tc "B. Background " \l 2}

Standard 90.1 is complex and covers a broad spectrum of the energy related components and systems in buildings ranging from simple storage buildings to complex hospitals and laboratories. The size of buildings addressed range from those smaller than single family homes to the largest buildings in the world. Changes to the standard include changes made primarily to improve usability and changes made to directly address energy stringency through impacting construction requirements. Because of the wide variation in buildings and how energy is used in those buildings, the changes made to Standard 90.1 result in requirements that can have varying energy impact in commercial buildings. For this reason, in past determinations, DOE has published both a qualitative analysis of all changes between the baseline standard and that of the standard for which the determination is sought, and a quantitative analysis that estimates the improvement in building energy performance under the amended standard and the baseline standard in question.

The first formal determination on Standard 90.1 was made on Standard 90.1-1999 (ASHRAE 1999). As this was the first DOE determination on Standard 90.1, DOE held a public workshop on February 7, 2000, to discuss the determination methodology and to receive stakeholder feedback on its proposed methodology. 65 FR 6195. The initial methodology was revised in response to comments[1]; on July 15, 2002, DOE published a formal determination on Standard 90.1-1999, which indicated that Standard 90.1-1999 would improve energy efficiency in commercial buildings. 67 FR 46464.

The second formal determination was for the 2004 edition (ASHRAE 2004a) (Standard 90.1-2004). The 2004 edition was reorganized to improve usability, and new climate zones were used in place of the climate bins used in Standard 90.1-1999. DOE relied on the same methodology as in the Standard 90.1-1999 determination. Information on the final determination on the Standard 90.1-2004 is available at http://www.energycodes.gov/implement/determinations.stm/. On December 30, 2008, DOE published a formal determination on Standard 90.1-2004, which indicate that Standard 90.1-2004 would improve energy efficiency in commercial buildings relative to Standard 90.1-1999. 73 FR 79868.

DOE did not conduct a formal determination of energy savings on the 2001 edition (ASHRAE 2001) (Standard 90.1-2001). Initial review of the changes made in the 2001 edition indicated that while the changes typically improved the usability and understandability of the text, the only changes that could quantitatively be compared were estimated to result in negative energy savings and therefore in a non-affirmative determination. These changes, primarily to slab edge insulation requirements in cool and cold climates, were estimated to have a minor impact in terms of energy efficiency in buildings at the national level, but no simulations were made to quantify the impact. DOE included discussion of addenda to Standard 90.1-1999 and Standard 90.1-2001 in the Standard 90.1-2004 determination.

1.2.2 Publication of Standard 90.1-2007

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) and the Illuminating Engineering Society of North America (IESNA) published ANSI/ASHRAE/IESNA Standard 90.1-2007 (Standard 90.1-2007) in December 2007.

Standard 90.1-2007 was developed under American National Standards Institute (ANSI) approved consensus standard procedures. Standard 90.1-2007 is under continuous maintenance by a Standing Standard Project Committee (SSPC), for which the ASHRAE Standard Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. ANSI approves addenda after their approval by ASHRAE and IESNA, but prior to their publication and, therefore, prior to their inclusion in a new edition of Standard 90.1.

[1] A description of the changes in methodology in response to comments for the Standard 90.1-1999 methodology may be found in the Federal Register notice of that determination.

1.3 Purpose

The purpose of this document is to describe the methodology and analytical approaches that DOE proposes to use to evaluate Standard 90.1-2007 and determine if Standard 90.1-2007 will improve energy efficiency in commercial buildings.

This document is intended to inform stakeholders of the methodology the Department proposes to use in making its determination regarding Standard 90.1-2007. Section 2 provides an overview of the methodology. Sections 2.1 through 2.5 discuss the analyses DOE intends to use in making its determination. Information regarding the results of the DOE determination will be posted on the DOE website at http://www.energycodes.gov/implement/determinations.stm/.

2. OVERVIEW OF THE DETERMINATION METHODOLOGY

The methodology that will be used to assess the relative energy efficiency of Standard 90.1-2004 and Standard 90.1-2007 will be similar to that used in past determinations. It will be based on both a qualitative comparison of the criteria in the two standards and a quantitative estimate of numerical energy savings based on those criteria.

The qualitative and quantitative comparisons are combined in DOE's overall determination of energy savings of any version of ASHRAE Standard 90.1. In general, if the quantitative comparison shows positive energy savings and the qualitative comparison show few potential (but unquantifiable) negative impacts, then DOE will issue an affirmative determination. If the quantitative determination does not yield significant positive energy savings, but the qualitative comparison shows mostly positive impacts, DOE may issue an affirmative determination.

2.1 Changes to the Methodology Used in Prior Determinations

The changes to the methodology used in prior determinations are all associated with the quantitative (numerical) estimate of energy savings. The main changes involve use of a new simulation engine (EnergyPlus), use of new building models, inclusion of more climate locations, and inclusion of high-rise multi-family buildings. In addition, DOE has modified the approach to addressing variability within building types. These changes are discussed in more detail in Section 2.3.

2.2 Qualitative Comparison

A qualitative comparison of the requirements in each edition of Standard 90.1 provides for a comparison of the relative energy efficiency of the editions in specific areas and of key requirements with significant impact on building energy use. In some instances, the qualitative comparison allows the relative stringency of common sections of the standards to be quickly compared. For example, increases in equipment efficiency taken alone will be construed as positive increases in stringency.

The proposed methodology provides for a qualitative comparison of the stringency of the two editions of Standard 90.1 in each of the following areas:

- scope of the standard
- building envelope requirements
- building lighting and power requirements
- building mechanical equipment and systems requirements
- paths to compliance.

In the scope comparison, the buildings and construction covered by each Standard will be evaluated. In each of the envelope, lighting, and mechanical sections, the qualitative comparison will focus on differences in particular requirements provided in each section, any difference in overall coverage of building components in each section.

In the building envelope section, the comparison will include discussion on the impact of the different building envelope requirements on the building heating and cooling loads for different building types and climates. The envelope comparison would examine requirements for all envelope components, including roofs, walls, floors, and fenestration as well as explore variations in requirements and stringency by envelope construction type and window area fraction.

In the building lighting section comparison, the focus would be primarily on the impact of the different lighting requirements on lighting energy use. The comparison would look separately at the whole-building and space-by-space lighting requirements in both standards in a variety of commercial building and space types as well as examine the effect of any additional lighting power allowances in the two Standards. In addition, changes in exterior lighting requirements and the relative coverage of exterior lighting requirements will be addressed.

In the building mechanical section, the evaluation will include comparisons of equipment efficiency requirements and system design requirements. Comparison of the equipment efficiency requirements will include discussion of any changes in scope of equipment or systems covered as well as the influence of external factors, including existing and soon to be enacted minimum manufacturing efficiency standards for equipment used in commercial buildings. System design requirements can affect both the system's efficiency and thermal loads on the equipment. In addition, the requirements may have direct impacts on the energy use of the equipment not captured in the equipment efficiency requirements (e.g. system fan power

requirements). Relative stringency of system design requirements will be discussed based on practical application of the system design requirements in each standard.

All editions of 90.1 have the same multiple paths for compliance. DOE will enumerate several paths to compliance where they exist and will separately discuss the relative impact on stringency of the requirements in the standards for all paths, including prescriptive, system performance, and whole-building performance compliance paths.

2.3 Quantitative comparison

{tc \l5 "Quantitative comparison}

The purpose of the quantitative analysis is to provide DOE a numerical evaluation of the relative energy efficiency of the the 2007 edition of Standard 90.1 compared to the 2004 edition when taken as a whole. The quantitative comparison of energy codes will be based on whole-building energy simulation of buildings built to either the ASHRAE Standard 90.1-2004 or 90.1-2007. It is not feasible to simulate all possible permutations of building design, nor is the data available to correctly weight each possible permutation in each possible U.S. climate as a fraction of the national building construction mix. Hence, the quantitative analysis focuses on using simulation models of a sample of buildings that represent or characterize a particular subset of the building population. It will then modify the building components described in the simulations so as to represent minimum requirements for buildings constructed to meet Standard 90.1-2004 and Standard 90.1-2007. Both the set of buildings representing Standard 90.1-2004 and Standard 90.1-2007 requirements will then be simulated for different climates, and the energy consumption data for each sample building will be extracted by fuel type and end use.

A comparison of the significant differences in the quantitative determination for prior determinations and the current determination is shown below in Table 1.

Table 1. Comparison of Prior to Current Quantitative Determination Methodology

	Standard 90.1-1999 and 90.1-2004 Determinations	2007 Determination
Building Simulation Tool	BLAST (BLAST 1991)	EnergyPlus (DOE 2008b)
Source and Description of Building Models	Single generic three-story 48,000 sf slab on grade building model with changeable envelope characteristics (e.g. Window-Wall-Ratio, Wall-Type) and Changeable Internal Plug Loads and Lighting Loads and Schedules	Building-specific Building Models from DOE Benchmark Building Task (DOE 2008a) (see discussion following Table 1)

Building Types Included in Comparison	Office Retail Warehouse Education Lodging Public Assembly Food Service *(Multi-family Residential buildings not included)*	Medium Office Large Office Warehouse Hospital Mid-Rise Apartment
Method of characterizing building "type"	Changing of internal loads and schedules in building models	Building-specific designs based on typical building characteristics, including building design, size and shape, and schedules developed from various data sets and engineering judgment during DOE Benchmarks development
Method of characterizing building-type population characteristics	National Characteristics Data Set (CBECS99)(EIA 1999) used in development of weights for key characteristics known to vary within building "types" (i.e. window-to-wall ratio, mass versus frame wall construction, electric resistance versus gas heat fuel source; simulations done for each of the above characteristics and weighted to final EUI	National Characteristics Data Set (CBECS03) (EIA 2003a) used in development of Benchmarks Building Models characteristics.
HVAC System Type	Generic Single Zone DX equipment with Gas Furnaces used for all buildings by Lodging. Lodging category represented with PTAC equipment with electric resistance. More detailed system models not considered.	Varies depending on building types. Cooling Systems include Single Zone DX Systems, Central Chiller VAV, and Water-loop Heat Pumps. Heating Systems include hydronic boilers and furnaces and zone reheat systems in VAV models

HVAC Efficiencies	HVAC efficiencies improvements modeled. Determination "Credit" given for changes to HVAC efficiencies in Standard if not already in Federal Law	Same; however, efficiencies with effective dates that are more than 3 years out from date of standard are not included.
Ventilation Rates	Ventilation based on Standard 62-1989 (ASHRAE 1989b)	Ventilation based on Standard 62-2004 (ASHRAE 2004b)
Extracted Data	Zonal Energy used for Direct Electric Loads, DX Cooling Energy including Fan Energy, Zone Heating energy and SHW energy in central plant Zonal Data used to develop representative EUI for building population with the simulated characteristics using core and perimeter zone area weights developed from CBECS Size and Form Factor Data by building type	Whole-Building Energy Use Data for Electric and Gas Energy Use extracted for each building model
Fuel Types – Cooling	Electric	Electric
Fuel Types – Heating	Gas Furnace or Electric Resistance Furnace, with Electric Furnace weights developed through CBECS estimates	Gas and Electric depending on Benchmark building HVAC system characteristics
Fuel Types - Hot Water	Gas and Electric (Electric assumed for all buildings with electric heat)	Electric resistance for mid-rise apartment and warehouse, gas for other building types
Climate Zones Simulated	11 Climate Locations used in 1999 development	15 climate locations each representative of one of the 15 U.S. climate zones used in defining the requirements in Standard 90.1-2004 and Standard 90.1-2007.
Mapping between simulated locations to geographic regions	Specific Climate Simulations mapped to geographic census divisions using PNNL-developed weighting factors (vintage 1996)	A representative climate is selected for each of the geographic climate zones.

Building Construction weights	Construction Weights developed based on EIA-NEMS estimates 10 years of future new construction in census division by building type category (EIA 2003b)	Construction weights developed based on 5 years recent county construction data for building types represented by Benchmark Buildings (DODGE Data, including multifamily >3 stories) (McGraw Hill Dodge 2008)
Energy Characteristics Reported	EUI by Building Type and Census Division National EUI estimates through weighting across modeled building type categories	EUI by Building Type across U.S. National EUI estimates through weighting across modeled building type categories

DOE is developing a set of building models (called benchmark buildings). DOE will use these to help it quantify changes in building energy efficiency in various parts of the country in order to make its determination. DOE began the development of benchmark building models to provide a consistent basis for establishing energy savings for different DOE building technology programs. Each benchmark building is a prototypical design reflective of a broad building type category, but with construction details typical of buildings within that type category. They are a statistically valid representations of the new building stock based on DOE's Commercial Building Energy Consumption Survey (CBECS) results, coupled with extensive review by design professionals. Currently, DOE is developing 17 benchmark buildings representing nine different building use types (e.g. lodging, office, retail). The benchmark buildings consist of two parts: a tabular description of each benchmark building (called a scorecard) and an EnergyPlus building simulation model prepared using the EnergyPlus building energy analysis computer program, and reflecting the benchmark description.

While the benchmark buildings are continuing to be refined, DOE determined that five of these benchmark buildings (large office, medium office, mid-rise apartment, warehouse, and hospital) are sufficiently refined and significantly more representative of the current building stock than those used in prior determinations.

DOE proposes to perform a limited simulation of the five benchmark building types in all 15 climate zones defined in Standard 90.1. As for prior determinations, DOE will weigh the relative improvement in efficiency in each building type—as determined using estimates of building energy use intensity (EUI) for each benchmark—by an estimate of the current construction weights for that building type in each of 15 U.S. climate zones (developed using historical FW Dodge data for commercial construction representative of the benchmark building types), with a resultant national average energy use intensity calculated for each building type under both Standard 90.1-2004 and Standard 90.1-2007. DOE will calculate this relative improvement in energy use intensity in terms of site energy, source energy, and energy cost metrics for evaluation purposes. These three metrics were provided for each of the two previous

determinations. For the purpose of examining source and energy cost improvements, DOE intends to use Energy Information Administration (EIA) national average estimates of energy production heat rates and national average commercial energy prices as reported in the Annual Energy Outlook (AEO) 2008 (EIA 2008). It will then determine individually for each of these five building types whether Standard 90.1-2007 will provide an improvement in energy efficiency compared with buildings constructed in accordance with Standard 90.1-2004. If any benchmark building type appears to show a reduction in building energy efficiency nationally, DOE will examine whether a weighting of overall energy use intensity, taking into account the construction volume of the different building types, would result in a reduction in overall average commercial building EUI.

Specific requirements of the standard that would not be amenable to simulation within the scope of this analysis (such as system design issues in the mechanical sections of the standard) will be explored in the qualitative analysis.

2.4 Key Issues for the Quantitative Assessment.

(1) Characterization of stringency changes

DOE will characterize each change as either more stringent (will improve energy efficiency), less stringent (will reduce energy efficiency), no change in stringency, or indeterminate change in stringency to the standard.

(2) Interpretation of changes in scope between Standard 90.1-2004 and Standard 90.1-2007 for the determination

DOE's will review the changes to ASHRAE 90.1-2004 to identify any changes in scope regarding the energy using building features covered under the standard.

(3) Changes to referenced standards

There are changes in referenced standards between Standard 90.1-2004 and Standard 90.1-2007. For example, Standard 90.1-2004 references ASHRAE Standard 62.1-1999 in its normative references[2] section, and Standard 90.1-2007 references ASHRAE Standard 62.1-2004. DOE will analyze the differences between the reference standards and assess any changes in stringency that they may impose on Standard 90.1-2007, relative to the 2004 edition.

[2] Normative references are considered to be part of the standard and therefore must be followed to demonstrate compliance with the standard. ASHRAE also includes informative references that are not part of the standard and are included for information only.

(4) Addressing future effective dates for mechanical equipment requirements

Historically, Standard 90.1 provided for improved efficiency in mechanical equipment, using effective dates that occur after the standard is published—typically 2 or 3 years after publication. This has occurred in this fashion primarily to give manufacturers time to make available higher-efficiency equipment on the market for those states adopting the revised Standard 90.1 efficiency levels. In some cases, Standard 90.1 revised the efficiency requirements in the standard for certain classes of mechanical equipment to make them consistent with existing Federal minimum manufacturing standards for equipment efficiency. In the 90.1-1999 determination, DOE did not give credit for any revised equipment efficiency levels shown in the standard that were already recorded into Federal law as existing minimum or soon-to-be required minimum efficiency standards for all products manufactured in the U.S. DOE did this under the argument that since these standards would be in place regardless of the publication of the revised ASHRAE 90.1 standard, the adoption of the ASHRAE standard would not, in this regard, improve efficiency in commercial buildings. DOE did give credit for equipment efficiency improvements that, in fact, originated independently in ASHRAE 90.1-1999 and were not required by Federal law, nor were planned for Federal law at that time. In many cases, these improvements would eventually become minimum requirements in Federal law. However, because that process, to a large extent, followed their inclusion in a revised 90.1 Standard[3], DOE determined that the publication of the revised 90.1 did indeed result in improved efficiency in commercial buildings, in particular for states and jurisdictions that adopt Standard 90.1 efficiency requirements prior to these requirements being adopted as Federal manufacturing standards.

However, in ASHRAE 90.1-2007, ASHRAE set the effective date of certain of these improved equipment efficiency levels as far out as 2020, 13 years from the original publication date. DOE will continue this policy of crediting equipment efficiency improvements in Standard 90.1 that are not already incorporated in Federal law, except that it will include only the effect of equipment efficiency changes included in the Standard 90.1-2007 whose effective date in Standard 90.1 is by December 2010, which is within 3 years of the date of the publication of the revised standard. Improvements with effective dates greater than 3 years after publication will be considered in DOE's determinations about forthcoming editions of Standard 90.1.

[3] The Energy Policy and Conservation Act (EPCA), as amended, directs DOE to consider amending the existing Federal energy efficiency standard for certain classes of commercial and industrial equipment each time ASHRAE Standard 90.1 is amended with respect to such equipment. (42 U.S.C. 6313(a)(6)(A)) For each type of equipment, EPCA directs that if ASHRAE Standard 90.1 is amended, DOE must adopt amended energy conservation standards at the new efficiency level in ASHRAE Standard 90.1, unless clear and convincing evidence supports a determination that adoption of a more stringent level as a national standard would produce significant additional energy savings and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)) If DOE decides to adopt as a national standard the minimum efficiency levels specified in the amended ASHRAE Standard 90.1, DOE must establish such standard not later than 18 months after publication of the amended industry standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)), with the Federal energy efficiency standard to go into effect no later than two or three years after the effective date within the revised ASHRAE Standard 90.1 depending on equipment class.

(5) Weighting of impacts across climates and building types.

In past determinations, DOE has weighted impacts across climates and buildings types (and across other factors, such as system types) to provide an overall national estimate of energy savings percentage. This weighting process is highly dependent on the availability of usable data for development of weighting factors. A notable omission in previous determinations was the inclusion of impacts on high-rise residential construction. Data on the high-rise residential construction are not included in DOE's CBECS. Data for high-rise residential construction are found in DOE's Residential Energy Consumption Survey (RECS), but RECS only evaluates characteristics of dwelling units and not entire buildings. The FW Dodge construction data[4] used for the Standard 90.1-2007 determination will provide construction weights within this building category.

For the current determination, DOE will still weight the energy performance by climate within each of five building type categories, including non-residential building construction data (including mid-rise and high-rise residential) by State or census division and building type. These building types provide a good representation of the non-residential, residential, and semi-heated building envelope space-type categories in Standard 90.1. This will provide insight as to the relative impact of envelope requirement changes in Standard 90.1-2007 within these space-type categories. The five building types are also expected to capture most of the significant changes in lighting and mechanical systems that have occurred in Standard 90.1. DOE will weight the EUI estimates for both the Standard 90.1-2004 simulations and the Standard 90.1-2007 simulations using the construction weights for the simulated building types and climate zones.

(6) Impact of Standard 90.1 on additions and renovations to existing buildings.

Additions and renovations to existing buildings are included within the scope of Standard 90.1. However, title III of ECPA, which requires the department make a determination regarding Standard 90.1-2007, only governs new buildings. Therefore, this methodology will address only new buildings.

(7) The relative prevalence of the semi-heated building envelope subcategory in the building types proposed for analysis (e.g. warehouses).

Both Standard 90.1-2004 and Standard 90.1-2007 have separate envelope requirements for a semi-heated building space type. DOE believes that the semi-heated space types is most prevalent in warehouse buildings compared with other building types; however, it has little information on what fraction of warehouse space meets the definition of the semi-heated space type. For the quantitative assessment, the warehouse building that will be modeled consists of both a semi-heated space and a smaller conditioned office space. DOE proposes to assume that this benchmark model is representative of all warehouse space. However, DOE welcomes data demonstrating what fraction of warehouse space should actually be considered as semi-heated space for purposes of its determination.

[4] A brief description of the FW Dodge Construction data may be found at http://www.fwdodge.com/.

(8) Incorporation of multifamily residential buildings in DOE's determination and data for developing weighting factors for this building type.

In previous 90.1 determinations, DOE did not explicitly consider the impact of residential buildings covered under the 90.1 standard in the quantitative analysis. No residential building prototypes were simulated, nor were residential building weights used in DOE's estimate of the relative energy performance between different versions of Standard 90.1. . DOE will use the Mid-Rise Apartment building benchmark (four stories) for the Standard 90.1-2007 determination, and examine the relative Standard 90.1-2004 and Standard 90.1-2007 whole-building EUIs for that building type across climates and at a national average in assessing whether or not Standard 90.1-2007 will save energy in residential buildings covered by the standard. The FW Dodge data DOE is proposing to use for the Standard 90.1-2007 determination does include high-rise multi-family residential buildings and therefore DOE will be able to appropriate weight the impact of high-rise multi-family residential buildings along with the other building models used in this determination.

2.5 Stakeholder Input

The Department is interested in improving its methodology for determining if new editions of Standard 90.1 will improve the energy efficiency of commercial buildings designed and constructed to it. The Department is also interested in improving the time it takes for DOE to make its determination, thereby meeting the statutory requirement to complete its determination within 1 year of publication of a new edition of the standard. The Department encourages stakeholder review and comment on the methodology presented here.

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